

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2002-075014

(43)Date of publication of application : 15.03.2002

(51)Int.Cl.

F21S 2/00
 F21V 13/00
 F21V 15/00
 F21V 29/00
 G03B 21/00
 G03B 21/14
 G03B 21/16
 H01J 61/52
 // F21Y101:00

Best Available Copy

(21)Application number : 2001-172167

(71)Applicant : MATSUSHITA ELECTRIC IND CO LTD

(22)Date of filing : 07.06.2001

(72)Inventor : ICHIBAGASE TAKESHI
 HORIUCHI MAKOTO
 KAI MAKOTO
 SEKI SATOYUKI
 TAKEDA MAMORU
 YAMAMOTO SHINICHI
 SASAKI KENICHI

(30)Priority

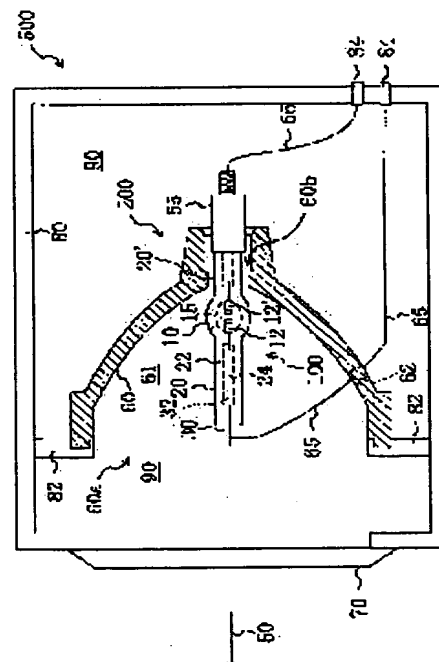
Priority number : 2000181277 Priority date : 16.06.2000 Priority country : JP

(54) LAMP UNIT AND IMAGE PROJECTION DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a lamp unit that controls a rise in inner temperature and enhances operation reliability.

SOLUTION: This lamp unit 500 is equipped with a lamp 200 with a mirror and a house 80. The lamp 200 with mirror comprises an arc tube 10, a discharge lamp 100 having a pair of sealing parts 20 and 20' and a reflecting mirror 60 having a front opening 60a, and is formed as non-encapsulated type structure. The house 80 has a transparent window 70 composed of material that can transmit the light outgone from the front opening 50a toward front of outgoing radiation direction 50 in the front opening 60a of the reflecting mirror 60.

**LEGAL STATUS**

[Date of request for examination]

07.06.2001

*** NOTICES ***

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

CLAIMS

[Claim(s)]

[Claim 1] It comes to have a lamp with a mirror, and a house holding said lamp with a mirror. Said lamp with a mirror The arc tube with which the electrode of a pair countered and has been arranged in tubing with which photogene is enclosed, The discharge lamp which has the closure section of the pair which closes each of the metallic foil of the pair electrically connected to each of the electrode of said pair, It is the reflecting mirror which reflects the light emitted from said discharge lamp, and the reflecting mirror which has front opening for carrying out outgoing radiation of the reflected light is included. Said lamp with a mirror It is the lamp unit which has the transparency aperture which said house becomes from the ingredient which penetrates the light by which outgoing radiation was carried out ahead [of said front opening of said reflecting mirror / direction of outgoing radiation] from said front opening by being formed in the structure of non-closed mold.

[Claim 2] Said lamp with a mirror is a lamp unit according to claim 1 which has the structure of non-[that said front opening of said reflecting mirror is opened wide] closed mold.

[Claim 3] Said house is a lamp unit according to claim 1 or 2 which has the structure where debris can be held so that debris when said discharge lamp disperses may not come outside.

[Claim 4] Said house is the lamp unit of any of claims 1-3 which have opening for exchanging the gas of the interior of said house, and the exterior, or one publication.

[Claim 5] Said house is a lamp unit according to claim 3 which has sealing structure.

[Claim 6] Said house is a lamp unit according to claim 5 further equipped with the convection-current equipment for cooling.

[Claim 7] Said transparency aperture is the lamp unit of any of claims 1-6 which consist of glass or reinforced plastics, or one publication.

[Claim 8] Said house is the lamp unit of any of claims 1-7 which consist of metals, or one publication.

[Claim 9] Said lamp unit is a lamp unit of any of claims 1-8 which are the lamp units for image projection equipments which set the optical axis of said discharge lamp and said reflecting mirror, or one publication.

[Claim 10] Said lamp unit is a lamp unit according to claim 9 constituted as a unit exchangeable as the light source for image projection equipments.

[Claim 11] Image projection equipment which is equipped with the optical system which makes the light source the lamp unit and said lamp unit of any of claims 1-8, or one publication, and is set by the discharge lamp contained in said lamp unit, and said lamp unit in the optical axis with said optical system.

[Claim 12] It is image projection equipment according to claim 11 which has at least the image display component chosen from the group which said optical system becomes from a digital micro mirror device and a liquid crystal display component, and a lens by constituting said lamp unit as a unit exchangeable as the light source for image projection equipments.

[Translation done.]

*** NOTICES ***

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to a lamp unit. It is related with the lamp unit especially used as the light sources for image projection equipments, such as the light source for liquid crystal projectors, and a digital micro mirror device (DMD) projector.

[0002]

[Description of the Prior Art] In recent years, image projection equipments, such as a projector which realizes a big screen image using a liquid crystal projector and DMD as a system, are used widely. Generally the high-pressure discharge lamp which has high brightness is widely used for such image projection equipment. In the light source used for image projection equipment, since it is necessary to condense light to the picture element contained in the optical system of a projector, in addition to high brightness, to be also close to the point light source is demanded. For this reason, it is observed also in the high-pressure discharge lamp as the light source with the extra-high pressure mercury lamp of the short arc mold which will have the features of quantity brightness soon more promising for the point light source. The extra-high pressure mercury lamp of a short arc mold is combined with a reflecting mirror, and can be used as the light source for projectors with the gestalt of a lamp with a mirror.

[0003] The lamp 1200 with a mirror equipped with the extra-high pressure mercury lamp 1000 of the short arc mold in the former is explained referring to drawing 7. Drawing 7 shows typically the lamp 1200 with a mirror which combined the extra-high pressure mercury lamp 1000 and the reflecting mirror 60.

[0004] The lamp 1200 with a mirror is equipped with the reflecting mirror (mirror) 60 which reflects the light emitted from a lamp 1000 and a lamp 1000. a lamp 1000 consists of quartz glass -- having -- abbreviation -- it has the spherical arc tube (bulb) 110, and the closure section (seal section) 120 of a pair and 120' which similarly consisted of quartz glass and were connected with the arc tube 110. Discharge space 115 is located in the interior of an arc tube 110, and mercury (amount of mercury enclosure:3, for example, 150 - 250 mg/cm), and rare gas (for example, argon of dozens kPa(s)) and a small amount of halogen are enclosed with discharge space 115 as photogene. In discharge space 115, fixed spacing (for example, about 1.5mm) is set, and the wolfram electrode (W electrode) 112 of a pair and 112' counter mutually, and are arranged.

[0005] The W electrode 112 is welded to the molybdenum foil 124 in the closure section 120 (Mo foil), and the W electrode 112 and the Mo foil 124 of each other are connected electrically. The closure section 120 has the glass section 122 and the Mo foil 124 which were extended from the arc tube 110, and holds the airtight of the discharge space 115 in an arc tube 110 by making the glass section 122 and the Mo foil 124 stick by pressure. The external lead (Mo rod) 130 which consisted of molybdenum is joined by welding, and the Mo foil 124 and the external lead 130 are mutually connected to the end of the Mo foil 124 electrically. In addition, about the configuration of W electrode 112' and closure section 120', since it is the same as that of the W electrode 112 and the closure section 120, explanation is omitted.

[0006] Next, the principle of operation of a lamp 1000 is explained briefly. If starting voltage is impressed to the W electrode 112 and 112' through the external lead 130 and the Mo foil 124, discharge of an argon (Ar) will take place, the temperature in the discharge space 115 of an arc tube 110 will rise by this discharge, and mercury will be heated and evaporated by it. Then, a mercury atom is excited and light is emitted in the W electrode 112 and the arc core between 112'. Although it is suitable as the light source of image projection equipment so that mercury vapor pressure is high since luminous efficiency also increases so that the mercury vapor pressure of a lamp 1000 is high, the lamp 1000 is used with the mercury vapor pressure of the range of 15-25MPa from a viewpoint of the physical pressure resistance of an arc tube 110.

[0007] It will be reflected with a reflecting mirror 60 and outgoing radiation of the light emitted from the lamp 1000 will be carried out toward the direction 50 of outgoing radiation. The reflecting mirror 60 has front opening 60a in the direction 50 side of outgoing radiation. As mentioned above, mercury vapor pressure of a lamp 1000 is made into physical pressure resistance within the limits of an arc tube 110 so that breakage may not arise on a lamp 1000, but in order [for the scattering prevention at the time of damaging a lamp] to prevent mixing of the foreign matter into a mirror, the front windshield 170 is attached in front opening 60a. That is, the lamp 1200 with a mirror has sealing structure, and he is trying for the debris (the piece of glass and mercury) produced at the time of emergency lamp breakage not to come outside. The external cash-drawer lead wire 65 is electrically connected to the external lead 130 of the closure section 120, and the external cash-drawer lead wire 65 is extended even besides a reflecting mirror 60 through the opening 62 for lead wire, and is electrically connected to the external circuit (for example, lighting circuit). The reflecting mirror 60 has fixed with closure section 120' of a discharge lamp 1000, and the mouthpiece 55 is attached in the end of closure section 120'.

[0008] When combining this lamp 1200 with a mirror with the optical system of image projection equipment (projector), as it is shown in drawing 8 R> 8 (a), it is common for it to be made the lamp house 180 and one holding the lamp 1200 with a mirror, and to use as a lamp unit 1500.

[0009] Drawing 8 (a) cuts a part of lamp unit 1500, lacks the configuration of image projection equipment including the lamp unit 1500 and optical system 190 (191-193), and shows it typically. Drawing 8 (b) is the perspective view which looked at the lamp house 180 of the lamp unit 1500 from the front. A lamp house 180 is the holder with which opening 180a for outgoing radiation light was prepared in the front face, and is having structure (the example of drawing 8 house of a L character mold) of non-closed mold. The lamp unit 1500 will be combined with the optical system 190 of image projection equipment by attaching a lamp house 180 in the position of image projection equipment. First, the outgoing radiation light from the lamp unit 1500 will pass along a lens 191, will reach the image display component 192 (for example, DMD and a liquid crystal display component (LCD)) of optical system 190, will pass along a projector lens 193 after that, and expansion projection will be carried out to a screen (un-illustrating).

[0010]

[Problem(s) to be Solved by the Invention] Since the conventional lamp 1200 with a mirror has sealing structure, the heat produced from a lamp at the time of lamp actuation shuts itself up in the interior of the lamp 1200 with a mirror, and it has the problem that the interior of the lamp 1200 with a mirror becomes an elevated temperature. That is, since making structure of the lamp 1200 with a mirror into sealing structure will be called for in order to expect perfectness at the safety of a lamp, as there is a possibility that the debris of a lamp may jump out outside and debris does not jump out outside if a lamp is damaged, at the time of lamp actuation, the ambient temperature inside [61] the lamp 1200 with a mirror rises, and the temperature of the closure section 120 also rises in connection with it. If the Mo foil 124 (it is the weld zone of the Mo foil 124 and the external lead 130 especially) oxidizes as a result of the lamp 1200 with a mirror becoming an elevated temperature since the molybdenum which constitutes the Mo foil 124 in the closure section 120 has the property to oxidize if it becomes 350 degrees C or more, the conductivity of the Mo foil 124 is lost and the lamp 1200 with a mirror will stop operating.

[0011] In the former, since the size of the lamp 1200 with a mirror was large, and the interior 61 of the lamp 1200 with a mirror was comparatively large, the temperature rise inside [61] the lamp 1200 with a mirror did not become a problem so much in many cases. Moreover, even if it originated in the light-emitting part 110 of a lamp deteriorating and the temperature rise inside [61] the lamp 1200 with a mirror arose from the reasons that the lamp life was comparatively short, nil why the output of a lamp was comparatively low, etc., it was possible to have guaranteed the operational reliability of a lamp comparatively.

[0012] However, in today, since the size of the lamp 1200 with a mirror became small It adds to extent of the temperature rise inside [61] the lamp 1200 with a mirror becoming large. Since it is becoming possible with the product base to secure a longer lamp life (for example, thousands of hours or more) with the improvement in a property of the light-emitting part 110 of a lamp, In order to guarantee the operational reliability of the lamp between long period of times, it is impossible to disregard the problem of the temperature rise inside [61] the lamp 1200 with a mirror. Moreover, in the situation that development of the lamp of high power is furthered more, since there is an inclination for the temperature of the lamp 1200 with a mirror to become very high by raising the output of a lamp, it is thought that it comes to actualize increasingly the problem of the temperature rise inside [61] the lamp 1200 with a mirror.

[0013] Moreover, when the lamp 1200 with a mirror was built into the optical system of a projector, for example as the light source of the projector using DMD, a part of light which carried out outgoing radiation

from the lamp 1200 with a mirror was reflected according to optical system, incidence was carried out to the lamp 1200 with a mirror, and the invention-in-this-application person found out that the phenomenon in which the temperature of the lamp 1200 with a mirror rises by it occurred. When such a phenomenon occurs, even if it predicts the internal temperature of the lamp 1200 with a mirror from the output of a lamp and designs the lamp 1200 with a mirror, the case where the operational reliability of a lamp cannot be guaranteed will arise.

[0014] Furthermore, the invention-in-this-application person examined how to make a hole in some reflecting mirrors 60 the making the air and the open air of the lamp 1200 with a mirror interior 61 exchange purpose. However, if a hole is made in some reflecting mirrors 60, in order that the area which reflects the light emitted from the lamp 1000 may decrease, the flux of light by which outgoing radiation is carried out from the lamp 1200 with a mirror will fall, and the optical engine performance of a lamp will fall. Moreover, since the lamp 1200 with a mirror is no longer sealing structure when a hole is made in some reflecting mirrors 60, a technical problem arises in the point of safety.

[0015] This invention is made in view of these many points, and the main purpose is in offering the lamp unit which controlled the temperature rise inside a lamp with a mirror, and raised operational reliability.

[0016]

[Means for Solving the Problem] The lamp unit by this invention comes to have a lamp with a mirror, and a house holding said lamp with a mirror. Said lamp with a mirror The arc tube with which the electrode of a pair countered and has been arranged in tubing with which photogene is enclosed, The discharge lamp which has the closure section of the pair which closes each of the metallic foil of the pair electrically connected to each of the electrode of said pair, It is the reflecting mirror which reflects the light emitted from said discharge lamp, and the reflecting mirror which has front opening for carrying out outgoing radiation of the reflected light is included. Said lamp with a mirror It is formed in the structure of non-closed mold, and said house has the transparency aperture which consists of an ingredient which penetrates the light by which outgoing radiation was carried out ahead [of said front opening of said reflecting mirror / direction of outgoing radiation] from said front opening.

[0017] As for said lamp with a mirror, it is desirable to have the structure of non-[that said front opening of said reflecting mirror is opened wide] closed mold.

[0018] As for said house, it is desirable to have the structure where debris can be held so that debris when said discharge lamp disperses may not come outside.

[0019] As for said house, it is desirable to have opening for exchanging the gas of the interior of said house and the exterior.

[0020] As for said house, it is desirable to have sealing structure.

[0021] As for said house, it is desirable to have convection-current equipment for cooling further.

[0022] Said transparency aperture should just consist of glass or reinforced plastics.

[0023] As for said house, it is desirable to consist of metals.

[0024] In a certain operation gestalt, said lamp unit is a lamp unit for image projection equipments which set the optical axis of said discharge lamp and said reflecting mirror.

[0025] In a certain operation gestalt, said lamp unit is constituted as a unit exchangeable as the light source for image projection equipments.

[0026] The image projection equipment by this invention is equipped with the above-mentioned lamp unit and the optical system which makes said lamp unit the light source, and is set by the discharge lamp contained in said lamp unit, and said lamp unit in the optical axis with said optical system.

[0027] In a certain operation gestalt, said lamp unit is constituted as a unit exchangeable as the light source for image projection equipments, and said optical system has at least the image display component chosen from the group which consists of a digital micro mirror device and a liquid crystal display component, and a lens.

[0028] In the lamp unit of this invention, the lamp with a mirror is formed in the structure of non-closed mold, and the transparency aperture is prepared in the house (housing) holding a lamp with a mirror. Therefore, since it becomes possible to move the gas inside a lamp with a mirror into a house, the temperature rise inside the lamp with a mirror at the time of lamp actuation can be controlled rather than the conventional technique. Consequently, the lamp unit which raised the operational reliability of a lamp can be offered. Moreover, since the temperature rise inside a lamp with a mirror can be controlled, the lamp unit which prolonged the lamp life can be offered. Furthermore, a transparency aperture can prevent the elutriation of debris by the transparency aperture, even when the debris (for example, the piece of glass and mercury) produced at the time of lamp breakage jumps out of front opening of a reflecting mirror, since it is

prepared ahead [of front opening of a reflecting mirror / direction of outgoing radiation]. The lamp with a mirror with which the lamp unit of this invention is equipped has the structure of non-[that front opening of a reflecting mirror is opened wide] closed mold.

[0029] Since the debris produced at the time of lamp breakage can be prevented from coming out to the exterior of a lamp unit when it has the structure where a house can hold debris, the safety of a lamp unit can be raised further. If opening for exchanging the gas of the interior of a house and the exterior above the direction of a vertical of a house is prepared at least, the temperature rise inside a lamp with a mirror can be controlled more effectively. When the house has sealing structure, the debris produced at the time of lamp breakage can be prevented from coming outside completely. If the house is equipped with the convection-current equipment for cooling, since the gas in a house can be circulated compulsorily, the temperature rise of a lamp with a mirror can be controlled still more effectively. A transparency aperture can consist of glass or reinforced plastics. If the house consists of metals, since the heat dissipation nature of a lamp unit can be raised, the temperature rise inside a lamp with a mirror can be controlled further.

[0030]

[Embodiment of the Invention] Hereafter, the operation gestalt of this invention is explained, referring to a drawing. In the following drawings, in order to give explanation brief, the same reference mark shows the component which has the same function substantially.

(Operation gestalt 1) The operation gestalt 1 by this invention is explained, referring to drawing 1 and drawing 2. Drawing 1 shows typically the configuration of the lamp unit 500 concerning this operation gestalt.

[0031] The lamp unit 500 is equipped with the lamp 200 with a mirror, and the house (lamp house) 80 holding the lamp 200 with a mirror, and the lamp 200 with a mirror is equipped with the discharge lamp 100 and the reflecting mirror 60 which reflects the light emitted from a discharge lamp 100. The lamp 200 with a mirror has the structure of non-closed mold where the front windshield is not formed in front opening 60a of a reflecting mirror 60. That is, it is formed in the structure of non-[that front opening 60a of a reflecting mirror 60 is opened wide] closed mold. Moreover, the house 80 holding the lamp 200 with a mirror has the transparency aperture 70 which consists of an ingredient which penetrates the light by which outgoing radiation was carried out from front opening 60a ahead [of front opening 60a of a reflecting mirror 60 / direction of outgoing radiation 50]. In addition to the role holding the lamp 200 with a mirror, the house 80 also has the role from which the lamp 200 with a mirror is protected.

[0032] The discharge lamp 100 with which the lamp unit 500 is equipped has an arc tube (bulb) 10, and the closure section 20 of a pair and 20' which were connected with the arc tube 10. The discharge space 15 where photogene is enclosed is in tubing of an arc tube 10, and the electrode 12 of a pair and 12' counter discharge space 15, and are arranged in it. The arc tube 10 consists of quartz glass, and is carrying out the abbreviation globular form. The outer diameter of an arc tube 10 is 5mm - about 20mm, and the glass thickness of an arc tube 10 is 1mm - about 5mm. The volume of the discharge space 15 in an arc tube 10 is about 0.01-1 cc. With this operation gestalt, the outer diameter of about 13mm, about 3mm of glass thickness, and the arc tube 10 with a capacity [of discharge space 15] of about 0.3 cc are used, and mercury is used as photogene, for example, about three 150 - 200 mg/cm mercury, the rare gas (for example, argon) of 5 - 20kPa extent, and a small amount of halogen are enclosed with discharge space 15.

[0033] The electrode 12 of the pair in discharge space 15 and 12' are arranged at intervals of about (preferably about 1-3mm) 1-5mm (arc length). As an electrode 12 and 12', a wolfram electrode (W electrode) is used, for example. With this operation gestalt, the W electrode 12 and 12' are arranged at intervals of about 1.5mm. The electrode shaft (W rod) of an electrode 12 is electrically connected to the metallic foil 24 in the closure section 20. the same -- the electrode shaft of electrode 12' -- closure section 20' -- it connects with the inner metallic foil 24 electrically.

[0034] The closure section 20 has the metallic foil 24 electrically connected to the electrode 12, and the glass section 22 extended from the arc tube 10, and holds the airtight of the discharge space 15 of an arc tube 10 by the foil closure of a metallic foil 24 and the glass section 22. The glass section 22 of the closure section 20 consists of quartz glass. A metallic foil 24 is for example, a molybdenum foil (Mo foil), for example, has the rectangular configuration. The closure section 20 has the cross-section configuration of for example, an approximate circle form, and the metallic foil 24 is located in a part for the abbreviation core of the closure section 20. The metallic foil 24 in the closure section 20 is joined to the electrode 12 by welding, and the metallic foil 24 has the external lead 30 in the near opposite side where the electrode 12 was joined. The external lead 30 consists of molybdenum and is connected with the metallic foil 24 by welding in the connection 32. In addition, since the configuration of these closure sections 20 is the same also about

closure section 20', explanation is omitted. One closure section 20 is arranged at the front opening 60a side (the direction 50 side of outgoing radiation) of a reflecting mirror 60, another closure section 20' is being fixed to the reflecting mirror 60, and the mouthpiece 55 is attached in the edge of closure section 20'. For example, with inorganic system adhesives (for example, cement etc.), closure section 20' and a reflecting mirror 60 fix, and are unified.

[0035] Closure section 20' and the reflecting mirror 60 which has fixed are constituted so that it may become the condensing flux of light converged on the parallel flux of light and a predetermined minute field, or the emission flux of light equivalent to having emitted from the predetermined minute field and the synchrotron orbital radiation from a discharge lamp 100 may be reflected. As a reflecting mirror 60, a parabolic mirror and an ellipsoid mirror can be used, for example. The opening 62 for lead wire is formed in the reflecting mirror 60, and the external cash-drawer lead wire 65 is extended even besides the reflecting mirror 60 through the opening 62 for lead wire. The external cash-drawer lead wire 65 extended even besides the reflecting mirror 60 is electrically connected to the terminal 84 prepared in the house 80, and a terminal 84 will be electrically connected to a non-illustrated external circuit (for example, lighting circuit). In addition, the mouthpiece 55 of a lamp 100 is also electrically connected with the terminal 84 through the external cash-drawer lead wire 66.

[0036] The reflecting mirror 60 is being fixed to the house 80 by the mirror holder 82. As long as the mirror holder 82 is the structure where a reflecting mirror 60 can be held, it may be structure which is not limited especially, for example, is fixed to a house 80 by bond part material (****ing bolt nut etc.) in a reflecting mirror 60, and may be the configuration that a reflecting mirror 60 is inserted in the mirror holder 82. Moreover, you may be the configuration that a reflecting mirror 60 and the mirror holder 82 paste up or stick mutually, and may be the configuration which fixes a reflecting mirror 60 to a house 80 by magnetism.

[0037] As shown in drawing 2, the mirror holder 82 consists of these operation gestalten by pushing a reflecting mirror 60 against some houses 80 using the force of a band 86, in order to simplify the configuration of the mirror holder 82. Drawing 2 shows typically the reflecting mirror 60 seen from the tooth back.

[0038] As shown in drawing 2, the both ends are being fixed by the band fastener 87, and the band (for example, wire) 86 has annular (the shape of a ring) structure, and can hook some bands 86 now on the band fastener (buckle) 88. for this reason, the tooth back of a reflecting mirror 60 -- ***** -- if it is made like, a band 86 is set and a band 86 is hooked on the band fastener 88, a reflecting mirror 60 is easily [a house 80] fixable. Since the mirror holder 82 shown in drawing 2 can fix the lamp 200 with a mirror easily with an easy configuration, its advantage is large when assembling a lamp unit. After fixing a reflecting mirror 60, it is desirable that the pawl 89 for migration prevention is formed so that a reflecting mirror 60 may not move.

[0039] Again, drawing 1 is referred to. The transparency aperture 70 which a house 80 has consists of glass or reinforced plastics. The transparency aperture 70 can prevent the elutriation of debris by the transparency aperture 70, even when the debris (for example, the piece of glass and mercury) produced at the time of lamp breakage jumps out of front opening 60a of a reflecting mirror 60, since it is prepared ahead [of front opening 60a of a reflecting mirror 60 / direction of outgoing radiation 50]. Therefore, in the lamp unit 500 of this operation gestalt, even if it uses the lamp 200 with a mirror with which the front windshield is not formed in front opening 60a of a reflecting mirror 60, the safety of a lamp is secured by the transparency aperture 70. In the lamp unit 500 of this operation gestalt, rather than the reflecting mirror 60 of the conventional lamp 1200 with a mirror shown by drawing 7, since temperature at the time of lamp actuation of a house 80 can be made low, not only glass but reinforced plastics and the advantage of becoming possible to use it suitably are also acquired as a component of the transparency aperture 70. Although the transparency aperture 70 is provided with this operation gestalt so that opening may be formed in the front face of the house 80 located ahead [direction of outgoing radiation 50] and the opening may be covered from the outside of a house 80, you may make it form the transparency aperture 70 so that it may cover from the inside of not only this but the house 80. Moreover, you may make it form the transparency aperture 70 in front some (for example, central part) or front all of a house 80 that is located ahead [direction of outgoing radiation 50]. Since it consists of these operation gestalten so that a house 80 may serve as sealing structure, even if a lamp 100 is damaged even if and debris (the piece of glass and mercury) arises, debris does not come out to the exterior of the lamp unit 500. That is, since the structure of a house 80 has the structure where debris can be held so that debris may not come out outside, it is made into what has the more certain safety of a lamp.

[0040] The house 80 consists of metals (for example, aluminum, stainless steel, iron, etc.). Since thermal

conductivity is typically good, a metal can raise the heat dissipation nature of a house 80 (lamp 200 with a mirror). Moreover, since it is easy to reuse a house 80 in the case of the house 80 constituted from a metal, there is an advantage also in respect of a deployment of a resource. The volume inside [90] the house 80 in this operation gestalt is about [800-2000cm] three. On the other hand, since the volume inside [61] a reflecting mirror 60 is 3 about 200cm, it becomes possible [increasing the volume inside / 90 / a house 80 4 to 10 times] to the volume inside [61] a reflecting mirror 60, for example. According to the configuration of the lamp unit 100 of this operation gestalt, it becomes possible from the temperature inside [61] the conventional lamp 1200 with a mirror at the time of lamp actuation to make it fall by about 10-50 degrees C. In addition, it is possible for the interior [90] 90 of the house 80 of the reflecting mirror 60 front and the house 80 of reflecting mirror 60 back to be connected, and for the air inside [90] a house 80 to move freely into drawing 1 , in the whole inside of a house 80.

[0041] Since it consists of these operation gestalten so that the optical axis of the lamp 100 and reflecting mirror 60 in the lamp unit 500 may suit, the lamp unit 500 can be suitably used as the light source of image projection equipment. If optical-axis doubling is not good, as for the brightness on a screen, it will also fall to about 60% that it is known that the image by image projection equipment will worsen, for example, the optical axis shifted small 0.4mm. in addition, the lamp unit 500 -- the headlight of an automobile -- since what is necessary is just to only illuminate the front in using it as a **, it is not necessary to carry out strict optical-axis doubling especially

[0042] Moreover, when it constitutes image projection equipment combining the optical system 190 (191-193) which showed the lamp unit 500 to drawing 8 , since the lamp unit 500 is constituted so that it may become a unit exchangeable as the light source for image projection equipments, it can perform installation and exchange to the image projection equipment of this lamp unit 500 very simple. Furthermore, when the lamp unit 500 is set to the lamp unit installation location in image projection equipment and it designs so that the optical axis of the lamp unit 500 and optical system 190 may suit, optical-axis doubling can be made to complete only by attached and exchanging the lamp unit 500.

[0043] Since the lamp unit 500 is equipped with the lamp 200 with a mirror of the structure of the non-closed mold a front windshield is formed and is not in front opening 60a of a reflecting mirror 60 according to this operation gestalt, the air inside [61] the lamp 200 with a mirror which serves as an elevated temperature at the time of lamp actuation can circulate the internal 90 whole of a house 80 not only the interior 61 of the lamp 200 with a mirror but widely (migration). Therefore, rather than the case of the conventional lamp 1200 with a mirror which was not able to convect only inside [61] the reflecting mirror 60, the temperature rise of the lamp 200 with a mirror at the time of lamp actuation can be controlled, consequently the operational reliability of a lamp can be raised more. Moreover, since it can be used where the temperature rise of the lamp 200 with a mirror is controlled, reinforcement of a lamp can be attained. Furthermore, the safety of a lamp is also secured with the house 80 which has the transparency aperture 70. In addition, since the lamp unit 500 is made into the unit exchangeable as the light source for image projection equipments, installation and exchange to image projection equipment can be performed very simple. And when optical-axis doubling at the time of setting the lamp unit 500 is also taken into consideration and designed, it becomes possible to also make optical-axis doubling complete only by attaching and exchanging the lamp unit 500.

[0044] Although the house 80 made into sealing structure was used in the lamp unit 500 of this operation gestalt, if it is made the structure where debris can be held so that the debris of the lamp 100 when a lamp disperses may not come out outside as shown in drawing 3 , it is also possible to use the house 80 with which opening 81 was formed. In the lamp unit 600 shown in drawing 3 , wrap covering device 81a is formed in the house 80 in the upper part of opening 81 so that debris may not come out outside from opening 81.

[0045] Since covering device 81a is formed in it as it prepares a clearance between the outer walls of a house 80, the air inside [90] a house 80 is as exchangeable as the open air through the clearance between opening 81 and covering device 81a, and a house 80. Therefore, as a result of the air inside [61] the lamp 200 with a mirror becoming an elevated temperature at the time of lamp actuation, even if the temperature of the air inside [90] a house 80 rises, the air can be exchanged for the open air through opening 81. For this reason, the temperature rise of the lamp 200 with a mirror can be controlled further. In order to move above the direction of a vertical by the convection current and to exchange efficiently the air and the open air of the interior 90 of a house 80, as for the air with high temperature, it is desirable that opening 81 is formed in the upper part part of the direction of a vertical of a house 80 at least.

[0046] Although at least one opening 81 should just be formed, in order to gather the effectiveness of

internal and external air exchange of a house 80, it is desirable to form two or more openings 81. Since it can be made the configuration in which opening 81 was formed in the part where temperature is the lowest, and the highest part when opening 81 is formed in an inferior surface of tongue and/or a side face in addition to the top face of a house 80, it becomes possible to be able to cause the convection current efficiently, consequently to freshen the air of the interior 90 more effectively.

[0047] In addition, in the lamp unit 600, in order to make it the structure where debris can be held so that debris may not come out outside, covering device 81a was prepared in the opening 81 of a house 80, but if it is the structure where debris can be held, especially the structure of a house 80 will not be limited. For example, you may make it form the network for carrying out as [come / debris / outside] etc.

(Operation gestalt 2) The lamp unit 500 of the above-mentioned operation gestalt 1 can also be made the configuration of the lamp unit 700 which formed the heat sink 56 in the mouthpiece 55 of a lamp 100, as it is the purpose reduced further and the temperature rise of the lamp 200 with a mirror is shown in drawing 4. Drawing 4 shows typically the configuration of the lamp unit 700 of this operation gestalt.

[0048] It is thermally combined with the lamp 100 and the heat sink 56 attached in the lamp 100 of the lamp unit 700 has the function which controls the temperature rise of a lamp by expanding surface area. A heat sink 56 is a fin for heat dissipation, and consists of ingredients with sufficient thermal conductivity (for example, metallic materials, such as aluminum and Cu). By forming a heat sink 56, the temperature rise of the lamp 200 with a mirror at the time of lamp actuation can be controlled more effectively. Even when a heat sink 56 is formed, it is also possible to form the opening 81 for exchanging the air and the open air of the interior 90 of a house 80 like the lamp unit 600 shown in drawing 3.

[0049] Furthermore, when it desires to control the temperature rise of the lamp 200 with a mirror still more effectively, as shown in drawing 5, it is also possible to make it the configuration of the lamp unit 800 which formed the convection-current equipment 95 for cooling in the house 80 of the lamp unit 500 of the operation gestalt 1. The convection-current equipment 95 for cooling is a cooling fan which circulates the air inside [90] a house 80 compulsorily. The convection-current equipment 95 for cooling is connected with the house 80 through the pipe 92, and by the convection-current equipment 95 for cooling, the air inside [90] a house 80 will be circulated compulsorily, and will be cooled. Consequently, the temperature rise of the lamp 200 with a mirror can be controlled still more effectively. In the lamp unit 800, it becomes possible from the temperature inside [61] the conventional lamp 1200 with a mirror at the time of lamp actuation to make it fall by about 50 degrees C - about 100 degrees C. Although the pipe 92 is made the configuration of one, you may constitute from drawing 5 so that the pipe for sending and the pipe for inhalation may be made separate. In addition, since the convection-current equipment 95 for cooling has the function which the air inside [90] a house 80 is circulated compulsorily, and is cooled, it can be attached in any house 80 of the lamp units 600 and 700.

[0050] In addition, it is suitable not only cooling by the cooling fan but to make it the configuration which a condensator is formed [configuration] in the convection-current equipment 95 for cooling, and makes gaseous temperature cool directly, when controlling the temperature rise of the lamp 200 with a mirror. Moreover, it is also possible to replace with the air inside [90] a house 80, for example, to use inert gas (N₂ etc.). Furthermore, it is the purpose for which the temperature of the lamp 200 with a mirror is reduced directly it not only cools the air inside [90] a house 80, but, and it is also possible to carry out as [pour / in the pipe 92 / arrange the pipe 92 connected to the convection-current equipment 95 for cooling at the tooth back of the reflecting mirror 60 of the lamp 200 with a mirror, and / refrigerants (for example, water etc.)]. That is, it is also possible to reduce the temperature of the lamp 200 with a mirror compulsorily with the method which pours a refrigerant. It is thought that the technique of controlling the temperature rise of such a lamp with a mirror compulsorily functions more effectively in the lamp with a mirror with which high watt-ization is advanced increasingly.

(Other operation gestalten) Since the temperature inside a lamp with a mirror can be reduced rather than the case of the conventional configuration according to the lamp unit of the above-mentioned operation gestalt, it becomes possible to make shorter than the conventional configuration the die length of the metallic foil 24 in the closure section 20 which has also played the role of heat dissipation of a lamp 100. By this, it also becomes possible to also make a lamp 100 miniaturize more and to offer the lamp unit equipped with the lamp 200 with a mirror miniaturized more, since it becomes possible. Moreover, since the temperature inside the lamp with a mirror at the time of lamp actuation can be reduced conventionally, a metallic foil may be able to be suitably constituted using other ingredients other than molybdenum.

[0051] Moreover, although the above-mentioned operation gestalt explained the lamp 200 with a mirror of the non-closed mold of a configuration of that the front windshield is not formed in front opening 60a of a

reflecting mirror 60 as an example As shown in drawing 6 , even if it is the case where the front windshield 170 is formed in front opening 60a, lamp 200 with mirror' of the non-closed mold of a configuration as opening (notching section) 60c to which air frequents some reflecting mirrors 60 is prepared can also be used. In the configuration of being shown in drawing 6 , opening 60c is prepared in the location in which it is most separated from the arc tube 10 of a lamp 100, and effectiveness of a light reflex is not not much reduced, for example, is formed in the part near front opening 60a of a reflecting mirror 60. [two or more] Since a front windshield becomes two sheets substantially with the transparency aperture 70 of a house 80, and the front windshield 170 of the lamp 200 with a mirror in the case of the lamp unit 900 of a configuration of having been shown in drawing 6 , effectiveness of the scattering prevention to the front can be enlarged.

[0052] Although the above-mentioned operation gestalt explained the mercury lamp which uses mercury as photogene as an example of a discharge lamp, this invention is applicable to any discharge lamp which has the configuration which holds the airtight of an arc tube by the closure section (seal section). For example, it is applicable also to discharge lamps, such as a metal halide lamp which enclosed the metal halogenide.

[0053] Moreover, although the case where mercury vapor pressure was 20MPa extent was explained with the above-mentioned operation gestalt (when it is the so-called extra-high pressure mercury lamp), it can be adapted also about the high-pressure mercury lamp whose mercury vapor pressure is 1MPa extent, and the low-pressure mercury lamp whose mercury vapor pressure is 1kPa extent. Moreover, the electrode 12 of a pair and spacing between 12' (arc length) may be short arc molds, and may be spacing longer than it. The discharge lamp of the above-mentioned operation gestalt is usable in any lighting method of an alternating current lighting mold and a direct-current lighting mold.

[0054] The lamp unit in the above-mentioned operation gestalt can be suitably used as for example, the light source for projectors, and also it can be used also as a projector which illuminates the light source for ultraviolet-rays steppers or the light source for game stadiums, the light source for headlights of an automobile, and a road sign.

[0055]

[Effect of the Invention] According to the lamp unit of this invention, the temperature rise of the lamp with a mirror at the time of lamp actuation can be controlled. Consequently, the lamp unit which raised the operational reliability of a lamp can be offered. Moreover, since the temperature rise of a lamp with a mirror can be controlled, it becomes possible to offer the lamp unit (lamp life: (from 5000 hours to for example, 10,000 hours)) which prolonged the lamp life.

[Translation done.]

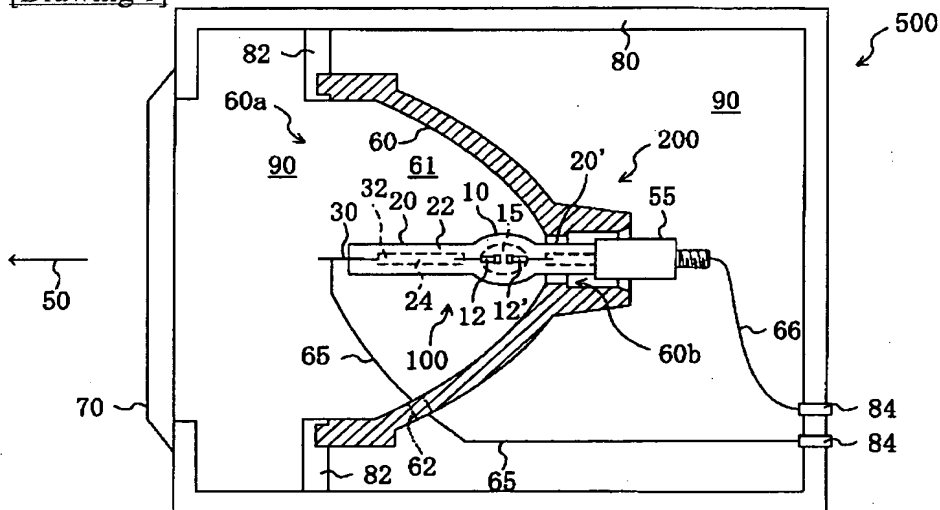
* NOTICES *

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

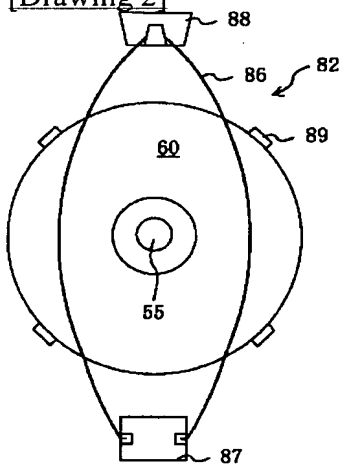
1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DRAWINGS

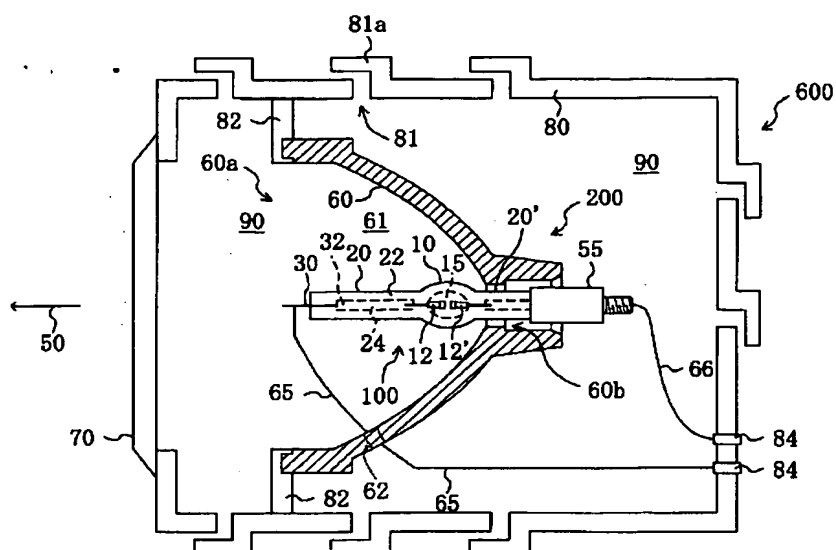
[Drawing 1]



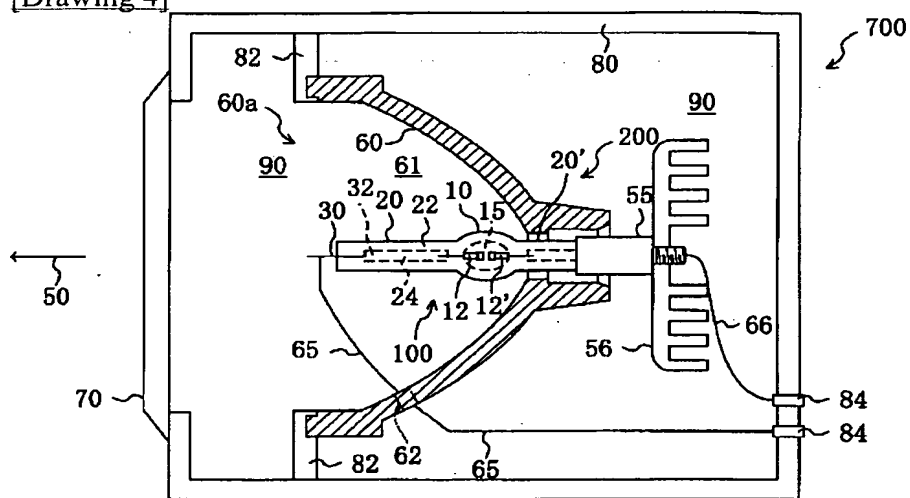
[Drawing 2]



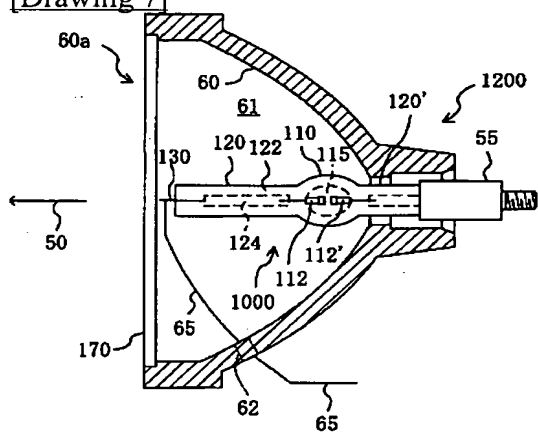
[Drawing 3]



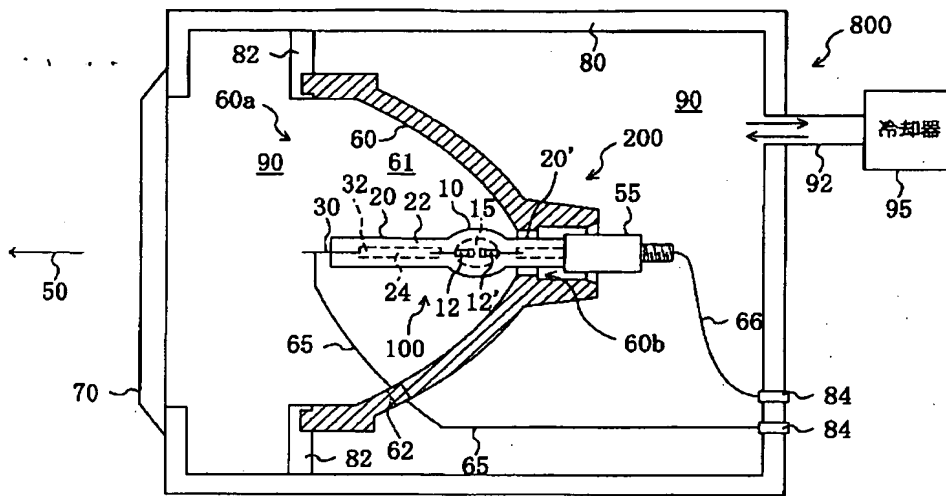
[Drawing 4]



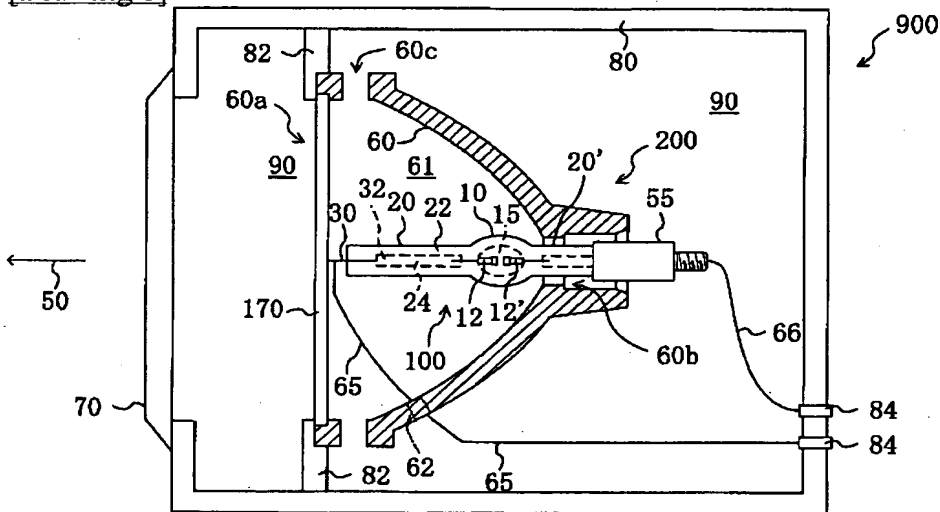
[Drawing 7]



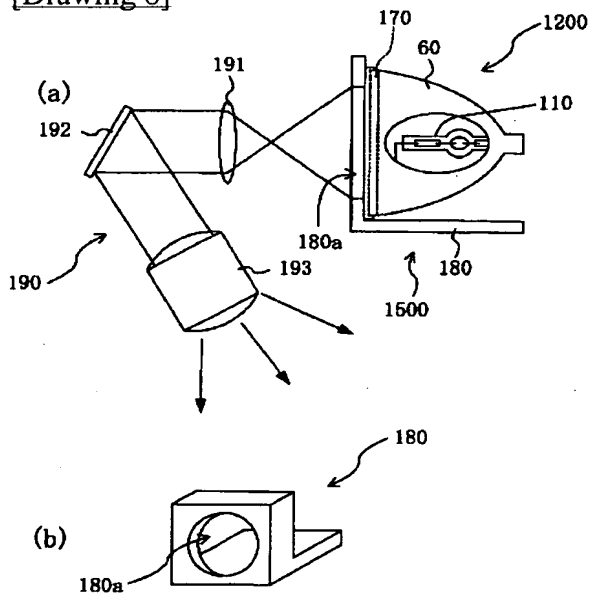
[Drawing 5]



[Drawing 6]



[Drawing 8]



[Translation done.]

**This Page is Inserted by IFW Indexing and Scanning
Operations and is not part of the Official Record**

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ **BLACK BORDERS**
- ☐ **IMAGE CUT OFF AT TOP, BOTTOM OR SIDES**
- ☐ **FADED TEXT OR DRAWING**
- ☐ **BLURRED OR ILLEGIBLE TEXT OR DRAWING**
- ☐ **SKEWED/SLANTED IMAGES**
- ☐ **COLOR OR BLACK AND WHITE PHOTOGRAPHS**
- ☐ **GRAY SCALE DOCUMENTS**
- ☐ **LINES OR MARKS ON ORIGINAL DOCUMENT**
- ☒ **REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY**
- ☐ **OTHER:** _____

IMAGES ARE BEST AVAILABLE COPY.

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.